FOUNDRISING

DRILLING REPORT FOR KIROBA-MALULU BOREHOLE IN KAMULI

Prepared by: Ayebale Ared

Technical advisor

December, 2019

Acronyms and abbreviations

Table 1: Acronyms and abbreviations

BH	Borehole
SWL	Static Water Level
DWL	Dynamic Water Level
PID	Pump installation depth (during test pumping)
DWD No.	Directorate of water development (identification) Number
Qair (m^3/hr)	Airlift discharge in Cubic meters per hour
µS	Micro siemens, a Unit for Electrical conductivity
CDO	Community Development Officer
WUC	Water User Committee
PID	Pump Installation Depth at test pumping
MWSL	Main Water strike level
WSL	Water strike levels
DTWR	Depth To Weathered Rock
DTBR	Depth To Bed Rock

Operational definitions

Borehole Drilling; refers to the processes through which boreholes that are nonfunctional or functional with difficulties due to reversible technical challenges can be brought back to functionality.

Operation and maintenance; refers to all the activities needed to run a water supply and sanitation scheme except for the construction of new facilities.

Contents

1. Introduction;

With an advisory agreement entered between Found Rising community development and Ared, I was supposed to guide and oversee the successful implementation of a laboratory verified clean and safe borehole water. Other purposes of the project was to act as a learning ground for what works wells or does not with a small drilling equipment especially PAT 401 rig that an organisation had in mind to own.

Activities undertaken

Table 2 activities undertaken

Dates	Activity
1st Sept-25th Nov 2019	Consultation on hiring of a drilling firm
25.10.2019	Consultation with the district water office and Visiting the village
12.11.2019	Supervision of Hydrogeological survey
25-30.11.2019	Supervision Drilling
1.12.2019	Supervision Test pumping
2.12.2019	Supervision Casting
7.12.2019	Supervision Installation of hand pump parts.

1.1. Consultation on hiring of a drilling firm

The aim of these consultations was to get a competent drilling firm. The target firms were to be owning the smallest drilling rigs, where lessons would be drawn from so that the organisation could own one in future.

Three drilling firms i.e. TGS water limited, Edensun Uganda limited and Draco were contacted and only Draco did not comply.

Quotations from TGS water limited and Edensun were shared and joint decisions were made to take on TGS water limited.

1.2. Consultation with the district water office and Visiting the village

It's always a good practice to keep stakeholders involved in WASH projects for the future sustainability of water facilities drilled or rehabilitated. For this case, the default stakeholder, government represented by the district water office Kamuli was visited by Olivia, David and Ared. Met was assistant district officer who welcome the team with pleasure and recommended that the organization can go ahead and drill in Kiroba-Malulu village since it was in the district's books a needy community in terms of access to clean water. He further noted that the organization follows and respects the government guidelines for any WASH intervention respecting the six critical requirements for a community to get a new water source or get a rehabilitation.

1.2.1. The six critical requirements

- Memorandum of understanding (Roles to play, what the community contributes to improve sanitation and hygiene and keep the water point contamination free.
- Land agreement
- Compulsory capital cost contribution (200,000ugx and 100,000ugx for a new and rehabilitated borehole respectively) paid to the district local government by the communities in need. Sometimes called co-funding and non-refundable
- Selection of water user committees
- Hygiene and promotion-100%, works well on the principals of an ideal homestead.
- Operation and Maintenance plans (includes bylaws and penalties for mismanaging the water facility, amount contributed per house hold each month for O&M, safe water chain etc.)

1.2.2. Community meeting and selection of Water User committee

The Team went ahead and visited Kiroba-Malulu village, had a meeting with community members.

In the meeting, the community was taken through processes of a quiring new borehole and their responsibilities.

For any water source to have a longer life, sustainability is a key. The major key players in having a sustainably functional water point all year round are the Water user committees. In Kiroba-Malulu, a committee was elected by the community with guidance from the Found Rising team. The election of committee was gender sensitive with females taking part in key positions. The table below shows the members elected and their responsibilities.

Figure 1: community meeting and elected wuc

Table 3: Water user committee

s/n	Name	Sex	Responsibility on the committee
1	Mugundu Patric	M	Chairperson WUC
2	Zaina Nadhiope	F	Vice chairperson WUC
3	Moses Balinaine	M	Secretary
4	Irene Kagoda	F	Treasurer
5	John Kifuko	M	Mobilizer
6	Charles Malinzi	M	Caretaker
7	Justine Mugaru	F	Caretaker
8	Nabirye Bakali	F	Member
9	Nadhiope John	M	Member

1.2.3. Preferred locations for the borehole.

Following the election of WUC, the community was requested to draw the map of their village on the ground indicating major and minor routes, existing deep boreholes and any available shallow wells. It's from this map that community was requested to indicate where they would prefer a borehole drilled.

The preferred locations are supposed to be three beginning with priority areas. These locations were chosen and physically visited and GPS coordinates picked, and details are shown in the table below.

Figure 2: Map of Kiroba-Malulu showing priority locations for a borehole

Table 4: Preferred locations of the community for a borehole

Point No.	Coordinates (Decimal Degree)		Land owners
	N	E	
1	0.84552	33.12570	Kagoda Moses
2	0.84663	33.12594	Deslanta
3	0.84565	33.12527	Charles Malinzi

1.2.4. Hiring the drilling Firm

Found Rising community development commissioned TGS water limited to carry out construction of one borehole in sub-county of Kitayunjwa in Kamuli District. The aim of this project was to increase access to clean and safe water in the community and serve as a learning project for any subsequent drilling projects to come in future.

The scope of work included hydrogeological surveys, drilling and installation of permanent casings, test pumping, casting of the apron and channel, water sampling for Physio chemical analysis, installation with hand pumps using stainless steel parts as guided by the ambient conditions of water and ministry of water and environment.

This report presents the results of the surveying, drilling, test pumping, casting the platform and installation of the borehole. **Error! Reference source not found.** shows Administrative location of the site.

Table 5: Administrative Location of the borehole

Table 6: Administrative location of the site

No.	District	Sub County	Parish	Village	DWD No.	GPS coordinates in Decimal degree	
						Y	X
1	Kamuli	Kitayunjwa	Namisambya 1	Kiroba-Malulu	55326	0.84552	33.12570

2. Activities undertaken by the contractor

Table 7: Activities undertaken by the contractor

Dates	Activity
12.11.2019	Hydrogeological survey
25-30.11.2019	Drilling
1.12.2019	Test pumping
2.12.2019	Casting
7.12.2019	Installation of hand pump parts.

2.1. Hydrogeological survey

One profile was done in village targeting two community preferred points (i.e. point 1 and 3) and some location with good potential landed in the road. A short confirmation parallel profile to confirm the potential was ran 15m away and the drill site was confirmed; The community was well represented, and the potential landed where their priority was.

Table 8: Surveying results

Sub County	Parish	Village	Ves No	Coordinates		Recommendations
				Y	x	
Kitayunjwa	Namisambya 1	Kiroba Malulu	1	0.84524	33.12574	Alternative
			2	o.84535	33.12502	Recommended

Figure 3: surveying activities and the location identified for drilling

2.2. Drilling

From one attempt, the borehole was achieved at 30.90m.

This borehole after installation of permanent casings, was gravel packed and developed until water cleared and airlift yield was estimated after well development as 7,200 l/hr.


Figure 4: Drilling activities

Table 9: Details of drilling

Village Name	Drilling Dates	DTBR (m)	DTWR (m)	Drilled Depth	Qair (m^3/hr)	MWS	WSL1	WSL2	WSL3	Casing depth
Kiroba-Malulu	25th -30th November 2019	17.46	14	30.38	7.2	19	11	19	21	17.46

2.3. Test pumping

The main objective of test pumping was to determine the safe yield and optimum installation depth of the pump. Therefore, for every successfully drilled borehole it is important to carry out test pumping.

Test pumping activities were carried out on 1/12/2019. This borehole was subjected to a short constant pumping rate of three (3) hours and recovery until a recovery of 99%, and at the end of test-pumping, a water sample was collected and taken to Lira regional laboratory for Physio-chemical quality analysis.

The detailed and analysed results of the test pumping program are given in Annex 1 while table 10 below shows parameters obtained in the field.

Table 10: Details of test pumping

Date	Village name	Source name	DWD No.	SWL (m)	DWL (m)	PID (m)	Constant rate test (l/hr)	Recovery (%)
/12/2019	Kiroba-Malulu	Kuroba-Malulu	55326	5.70	7.4	17	2557	99

Figure 5: A technician taking results and measuring E.C during test pumping

2.4. Water quality testing

The results of the water quality analysis from regional laboratory Lira indicate that the water quality meets the standard for human and livestock consumption. The water quality analysis results are detailed in Annex 3. However, it's a good practice to measure the ambient (i.e. E.C and pH) conditions of ground water right at the time of test pumping as water is drawn from the borehole, the contractor only had an E.C meter and was found in acceptable ranges of (520/2500)µS.

Figure 6: E.C measurement during test pumping

2.5. Casting of the apron and the channel

For boreholes whose water quality are found to be compatible for human and livestock consumption, are casted and later after the process of curing the apron, hand pump parts can be installed as guided by the test pumping results and ministry water and environment.

Kiroba-Malulu was casted on 02/12/2019 after the field ambient conditions of E.C were found ranges of acceptable national standards (520/2500) µS and was subjected to 5 days of curing before installation of hand pump.

On the apron, before it dries, it is always good practise to have details of the donor, funder, DWD no., date of completion and drilled depth. And all this was written on the apron of Kiroba-Malulu borehole.

2.6. Hand pump installation and soak pit construction

Stainless steel hand pump parts were installed on 7.12.2019. It took 7 strokes to bring out the first drop of water and after 20 minutes, a leak test was done, and water began coming out at half a stroke indicating the installation was well done. Installation certificate is shown in Annex 2

The community was guided on soak construction where members who were shown the dimension and they dug it one meter deep, was not fully filled with lateritic stones since the community had lost a member and most people to help bring stones were at the burial.

Figure 7: Hand pump installation activities

Figure 8: a community member pumping after installation and guiding the community on soak away pit

3. Lessons and experiences

- A small rig is not a good option for the organisation to own since it increases costs of being in field against time and has difficulties in drilling competent rocks.
- Drilling in Busoga sub region is better in a dry season as accessibility can be a huge deal.
- There is always a need to measure the ambient conditions of ground water at the site especially for pH and Electrical Conductivity (E.C) during drilling and test pumping to save the fresh water aquifers from being contaminated by salty aquifers.
- There is always a need to use well experienced technicians when it comes to ground parts installation in any borehole.
- Sign post and the plaque card were of poor quality and the sign post can wear very fast since it's not a writing on the metal but rather on a sticker paper

Figure 9: Sign post made with a sticker polyethene.

4. Challenges

- Access to the site was a challenge due to heavy rains in the area.
- Drilling took longer than expected as penetration reduced to 2.5 hours per meter.
- Lack of support from some government officials especially the community development officer of sub county who was approached and did not comply. The CDO is key in community mobilisation for such activities of WASH.
- The market is full of compromised pump parts and this led to a challenging installation activity of one borehole for a full day.
- Limited technical personnel as the contractor only sent one technician without a helper for installation activities.

5. Recommendations and Conclusion;

5.1. Recommendations to Found Rising community development.

- Top down approach in getting communities to intervene should be the order of the day to avoid any mis understanding in districts of operation. (top down, here I mean begin with the district and let them understand our intervention and guide us on the next level as we move down to acquire site)
- All time supervision of the technical activities to ensure quality by the organisation is paramount.
- Supervisors should be with pH and E.C meters when drilling or rehabilitating boreholes to have a know at the ambient conditions of ground water.
- Contractors should always be advised to send enough crew to avoid reliability on community people in critical activities.

- Found Rising should train the community on operation and maintenance procedures of the water point to ensure sustainability.
- In future, the organisation will need a social worker or two to help make communities understand their role in such WASH projects.
- The organisation can expand on the scope of community help by introducing rehabilitation of old existing boreholes that are non functional or functioning with difficulties.
- As was seen during the project, a small rig may not perform well with some basements of Busoga areas and the recommended rig is a 501-PAT rig with an Atlas Copco compressor (Details previously shared by Yasin)
- In order to do well with rehabilitation works, an inhouse or hired technician should be brought to do assessment and the organisation can understand the scope work and value it before hiring a company to do major rehabilitation. It's expensive to hire a company to do assessment and worsens when the same company has to the evaluate the scope of the works and determine the costs of rehabilitating a borehole.

5.2. Conclusion.

- It was nice having such a great team that aimed at jointly achieving the goal.
- The Drilling program was a success with Kiroba-Malulu borehole now functional and the contractor can therefore be paid in accordance with the contract.

Annexes.

Annex 1a: Test pumping results (drawdown)

TGS water Ltd.

HOUR CONSTANT RATE
TEST DATA SHEET

[illegible]	513908
UTM Y	93433
DWD No.	55326
Source Name	KIROBA MALULU
Village	Kiroba MALULU
Parish	NGMISAMBYA 1
Sub-County	KIHAYUNJWA
County	Bugabula South
District	KAMULI

Osman Road, Plot 12 Lira
Lake Drive Road Plot 41
Luzira, Kampala
P.O. Box 37461 Kampala (U)
Tel: 0312 265130,
0772222049/10,
E-mail: tgswater@gmail.com

Project Nr:	Name:	Found Rising KAMULI	
Date start: 01/12/2019	Time: 9:11	Top of screen 1	No screen m
Date end: 07/12/2019	Time: 12:11	Available Drawdown	11.30 m
Casing Inner Diameter	127 mm		
Pump Pipe Outer Diameter	40 mm	Datum Level dl)	0.26 magl
Total Depth of Well:	30.90 m		
Depth of Pump Intake:	17 mbdl	Reported Water Strikes 1	mbdl
Type of Pump:	SQ 5-70	2	mbdl
SWL	5.70 mbdl	3	mbdl
DWL	7.40 mbdl	4	mbdl
Yield Indicator	17 litres	5	mbdl

Time	Water Level	Time to Fill	Yield	Remarks
0	5.70			
1	6.35			
2	6.35			
3	6.36	54.19	1129	valve open brownish-red discharge
4	6.36			
5	6.36			
6	6.67	32.69	1872	valve adjusted, discharge slightly clearing
7	6.81			
8	6.88			
9	7.13	28.56	2142	valve adjusted, clearing discharge
10	7.29			
12	7.33			
14	7.35			
16	7.36			
18	7.37			
20	7.37			
25	7.38	24	2550	clean and clear discharge.
30	7.38			
35	7.38			
40	7.39			
45	7.39			
50	7.39			
55	7.39			
60	7.39			
70	7.40	23.93	2557	clean and clear discharge.
80	7.40			
90	7.40			
100	7.40			
120	7.40			
140	7.40	23.96	2557	
160	7.40			EC = 510 µs/cm @ 21.5 °C
180	7.40			water sample collected, Pump off

Found Rising

This water [illegible]
Anyii [illegible]
2019/12/07

Annex 1b: Test pumping results (Recovery)

TGS water Ltd.

RECOVERY DATA SHEET

UTM X	513908
UTM Y	93433
DWD Number	55326
Location/Village	KIROBA
Parish	NAMISAMBYA 1
Sub-County	KITANYUNJWA
County	BUGABULA SOUTH
District	KAMULI

Osman road plot 12 Lira, Lake Drive road, Plot 41, Luzira Kampala
P.O. Box 37461, Kampala, Uganda
Phone: + 256-(0)312 265 130
Fax: +256-(0)41-505798
Mobile: +256-(0)772-222049 / 222010
Email: uganda@tgswater.info
www.tgswater.info

Project Nr. :	Name: Found rising Kamuli			
Date start : 01/12/2019	Time: 12:11		Top of screen 1	No Screen - m
Date end : 01/12/2019	Time: 12:		Available drawdown	1.70 m
Total depth of well:	30.90	m	datum level (dl)	0.52 magl
Depth of pump intake:	17	mbdl	reported water strikes 1	mbdl
Type of pump:	SP 5-70		2	mbdl
SWL:	7.40	mbdl	3	mbdl
DWL:	5.72	mbdl	4	mbdl
Yield indicator	N/A	liters	5	mbdl

Time	Water level	Time to Fill	Yield	Remarks
0	7.40			
1	5.85			
2	5.84			
3	5.80			
4	5.78			
5	5.76			
6	5.76			
7	5.75			Recovery 97% in 7 min.
8	5.75			
9	5.75			
10	5.75			
12	5.74			
14	5.74			
16	5.73			recovery 98% in 16 mins
18	5.73			
20	5.73			
25	5.72			Recovery 98.8% in 25 mins
30	5.72			
35				
40				
45				
50				
55				
60				
70				
80				
90				

Recovery Sheet			Page 1 of 1
Signature Supervisor		Signature Contractor	

Aned.
Found Rising.

Angiri Ervi
2019/12/01

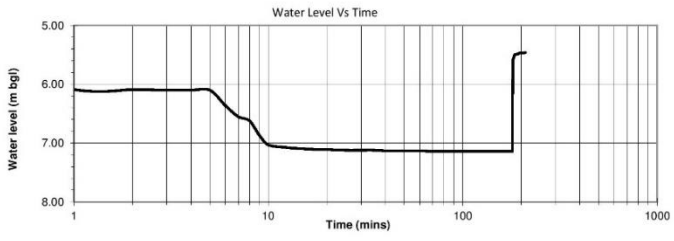
Annex 1c: Test pumping results (Analyzed data)

Pumping test data	Kiroba Malulu	Drilling Contract No.

Borehole No.	DWD	513908	Altitude		m amsl
FR Village number		UG.01	GPS east	2.02771	
Final Depth (m)		30.90	GPS north	33.39701	
Date:	1/12/2019		Drillers yield	7.00	m3/hr
Time Started	9:11		Time Finished	12:11	
Tested yield	2.56	m3/hr	Duration test	180.00	min
Water sample	yes	yes/no	Duration recovery	30.00	min
S.W.L at start test	5.44	m bgl	DWL end of test	7.14	m bgl
WSL1		m bgl	Drawdown	1.70	m
WSL2		m bgl	Recovery	99	%
WSL3		m bgl	Main water strike		m bgl
WSL4		m bgl	Depth of pump	17.00	m bgl
WSL5		m bgl	Measuring Point	0.26	m agl
Measured by :	Anyii Elvis		Supervisor:	Ared Ayebale	
Company :	TGS water limited		Client :		
Contract No.:			Contract Name:		

DRAWDOWN			
Time, t (mins)	Water Level (m bgl)	Drawdown (m)	Discharge, Q (l/h)
0	5.44		
1	6.09	0.65	
2	6.09	0.65	
3	6.10	0.66	1129
4	6.10	0.66	
5	6.10	0.66	
6	6.36	0.92	1872
7	6.55	1.11	
8	6.62	1.18	
9	6.87	1.43	2142
10	7.03	1.59	
12	7.07	1.63	
14	7.09	1.65	
16	7.10	1.66	
18	7.11	1.67	
20	7.11	1.67	
25	7.12	1.68	2550
30	7.12	1.68	
35	7.12	1.68	
40	7.13	1.69	
45	7.13	1.69	
50	7.13	1.69	
55	7.13	1.69	
60	7.13	1.69	
70	7.14	1.70	2557
80	7.14	1.70	
90	7.14	1.70	
100	7.14	1.70	
120	7.14	1.70	
140	7.14	1.70	2557
160	7.14	1.70	
180	7.14	1.70	

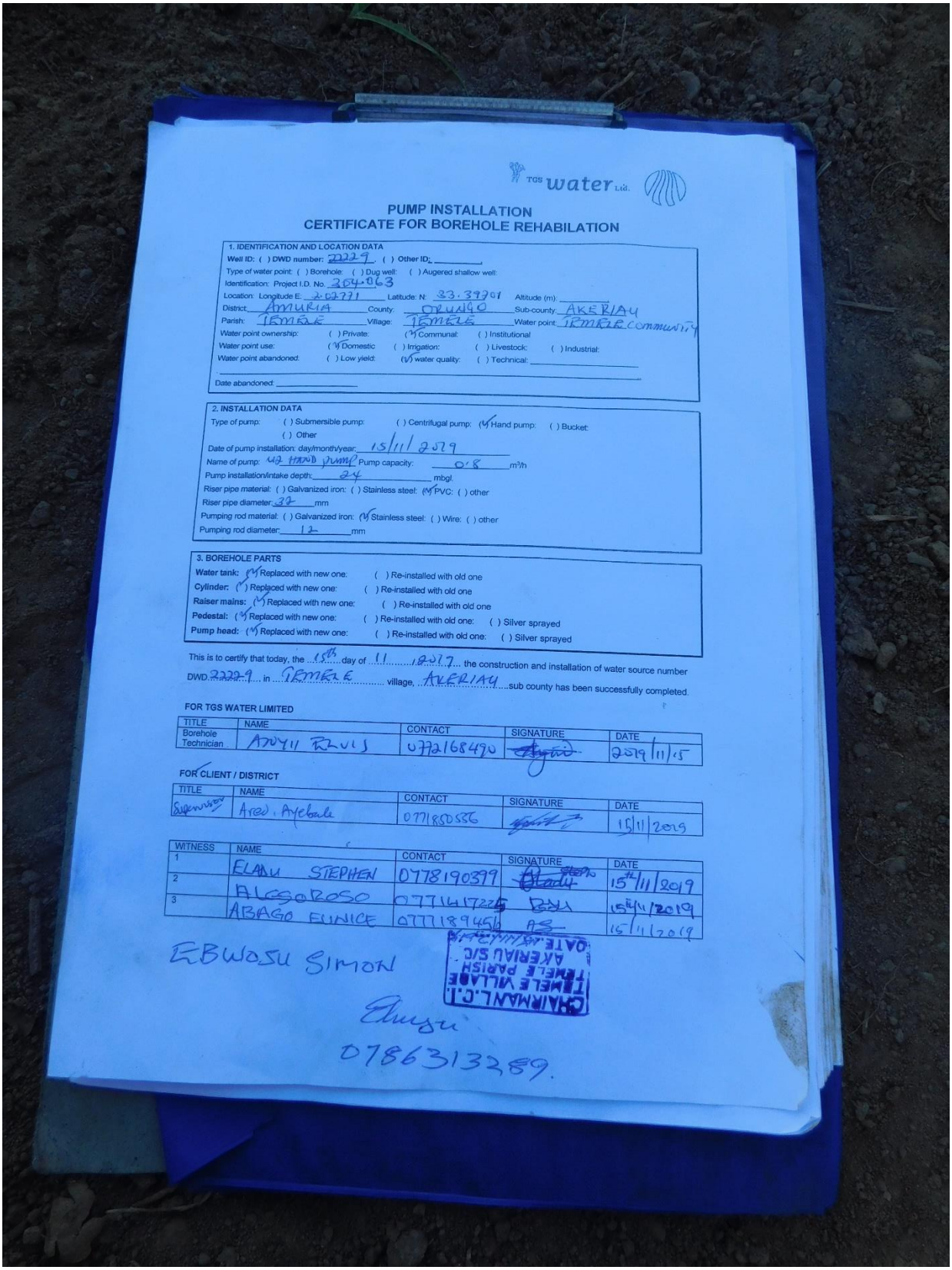
RECOVERY			
Time, t (min)	Time (min)	Water Level (m)	Residual Drawdown (m)
0	180	7.14	1.70
1	181	5.59	0.15
2	182	5.58	0.14
3	183	5.54	0.10
4	184	5.52	0.08
5	185	5.50	0.06
6	186	5.50	0.06
7	187	5.49	0.05
8	188	5.49	0.05
9	189	5.49	0.05
10	190	5.49	0.05
12	192	5.48	0.04
14	194	5.48	0.04
16	196	5.47	0.03
18	198	5.47	0.03
20	200	5.47	0.03
25	205	5.47	0.03
30	210	5.46	0.02
35	215		
40	220		
45	225		
50	230		
55	235		
60	240		
70	250		
80	260		
90	270		



Recommended pump installation depth 15 m bgl

Comments : The borehole indicated a drawdown of 1.7m after 180 minutes pumping at 2557 l/hr. The last dynamic water level was 7.4m below measuring point. The recovery was 99% in 30 minutes. Based on this data, we recommend to install the U2 hand pump at 15mbgl.

Annex 2: Installation certificate of the borehole



TGS water Ltd.

PUMP INSTALLATION
CERTIFICATE FOR BOREHOLE REHABILATION

1. IDENTIFICATION AND LOCATION DATA

Well ID: ( ) DWD number: 22229 ( ) Other ID: _____
Type of water point: ( ) Borehole ( ) Dug well ( ) Augered shallow well:
Identification: Project I.D. No. 304-063
Location: Longitude E: 2.02771 Latitude: N: 33.39791 Altitude (m): _____
District: AMURIA County: OKUNGU Sub-county: AKERIAU
Parish: TEMELE Village: TEMELE Water point: TEMELE community
Water point ownership: ( ) Private: (√) Communal: ( ) Institutional
Water point use: (√) Domestic ( ) Irrigation: ( ) Livestock: ( ) Industrial:
Water point abandoned: ( ) Low yield: (√) water quality: ( ) Technical: _____
Date abandoned: _____

2. INSTALLATION DATA

Type of pump: ( ) Submersible pump: ( ) Centrifugal pump: (√) Hand pump: ( ) Bucket: ( ) Other
Date of pump installation: day/month/year: 15/11/2019
Name of pump: U2 HAND PUMP Pump capacity: 0.8 m^3/h
Pump installation/intake depth: 24 mbgl.
Riser pipe material: ( ) Galvanized iron: ( ) Stainless steel: (√) PVC: ( ) other
Riser pipe diameter: 32 mm
Pumping rod material: ( ) Galvanized iron: (√) Stainless steel: ( ) Wire: ( ) other
Pumping rod diameter: 12 mm

3. BOREHOLE PARTS

Water tank: (√) Replaced with new one: ( ) Re-installed with old one
Cylinder: (√) Replaced with new one: ( ) Re-installed with old one
Raiser mains: (√) Replaced with new one: ( ) Re-installed with old one
Pedestal: (√) Replaced with new one: ( ) Re-installed with old one: ( ) Silver sprayed
Pump head: (√) Replaced with new one: ( ) Re-installed with old one: ( ) Silver sprayed

This is to certify that today, the 15th day of 11 2019 the construction and installation of water source number DWD 22229 in TEMELE village, AKERIAU sub county has been successfully completed.

FOR TGS WATER LIMITED

TITLE	NAME	CONTACT	SIGNATURE	DATE
Borehole Technician	AZUYU ELIUS	0772168490		2019/11/15

FOR CLIENT / DISTRICT

TITLE	NAME	CONTACT	SIGNATURE	DATE
Supervisor	Ayeb. Ayebale	0771850586		15/11/2019

WITNESS	NAME	CONTACT	SIGNATURE	DATE
1	ELAU STEPHEN	0778190399		15/11/2019
2	ALOSOROSO	0771417225		15/11/2019
3	ABAGO EUNICE	0771894456		15/11/2019

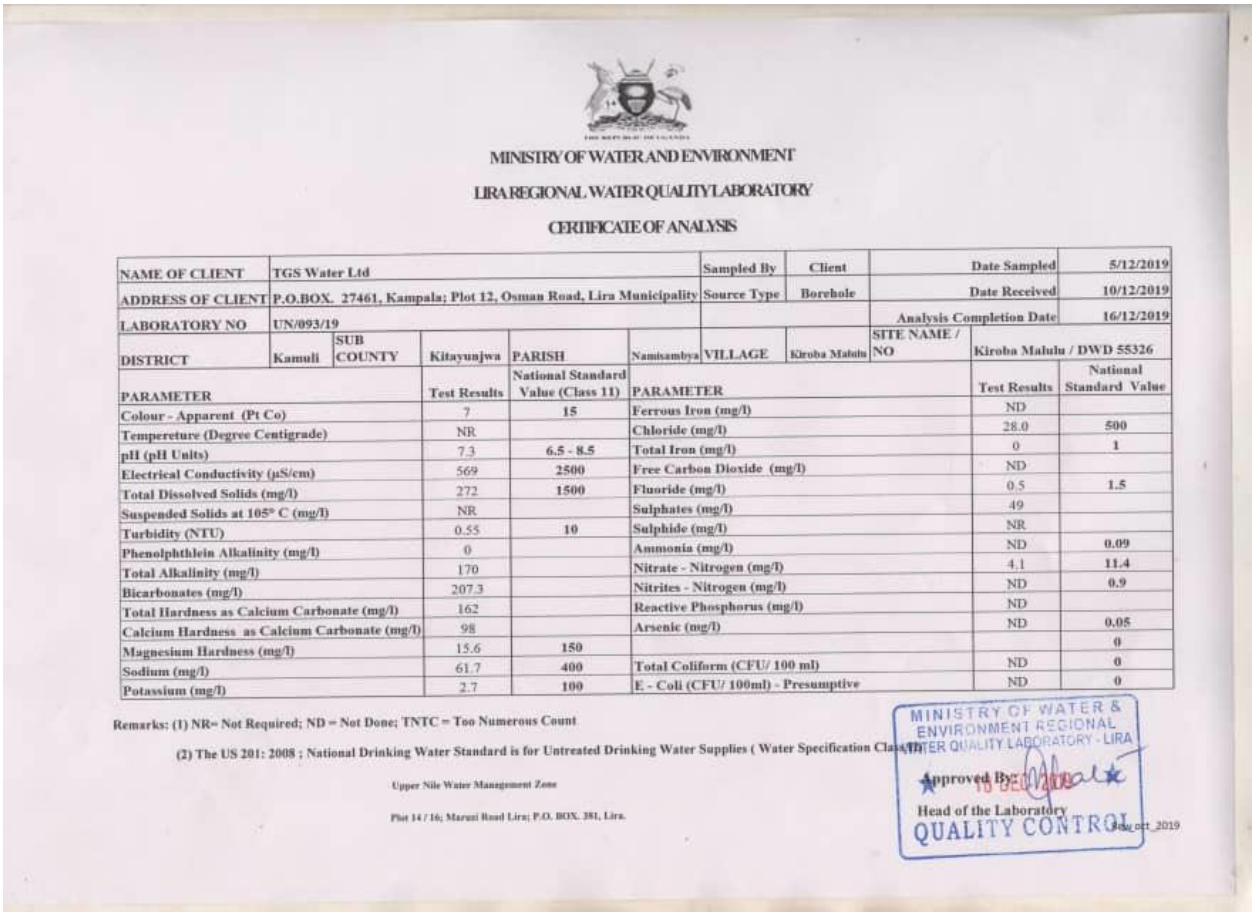
EBWOSU SIMON

CHAIRMAN L.C.I. TEMELE VILLAGE PARISH AKERIAU S/C DATE 15/11/2019

Ebwosu

0786313289.

Annex 3: Water quality results



MINISTRY OF WATER AND ENVIRONMENT

LIRA REGIONAL WATER QUALITY LABORATORY

CERTIFICATE OF ANALYSIS

NAME OF CLIENT	TGS Water Ltd				Sampled By	Client	Date Sampled	5/12/2019
ADDRESS OF CLIENT	P.O.BOX. 27461, Kampala; Plot 12, Osman Road, Lira Municipality				Source Type	Borehole	Date Received	10/12/2019
LABORATORY NO	UN/093/19						Analysis Completion Date	16/12/2019
DISTRICT	Kamuli	SUB COUNTY	Kitayunjwa	PARISH	Namisambya	VILLAGE	Kiroba Malulu	SITE NAME / NO	Kiroba Malulu / DWD 55326

PARAMETER	Test Results	National Standard Value (Class II)	PARAMETER	Test Results	National Standard Value
Colour - Apparent (Pt Co)	7	15	Ferrous Iron (mg/l)	ND	
Tempereture (Degree Centigrade)	NR		Chloride (mg/l)	28.0	500
pH (pH Units)	7.3	6.5 - 8.5	Total Iron (mg/l)	0	1
Electrical Conductivity (µS/cm)	569	2500	Free Carbon Dioxide (mg/l)	ND	
Total Dissolved Solids (mg/l)	272	1500	Fluoride (mg/l)	0.5	1.5
Suspended Solids at 105° C (mg/l)	NR		Sulphates (mg/l)	49	
Turbidity (NTU)	0.55	10	Sulphide (mg/l)	NR	
Phenolphthlein Alkalinity (mg/l)	0		Ammonia (mg/l)	ND	0.09
Total Alkalinity (mg/l)	170		Nitrate - Nitrogen (mg/l)	4.1	11.4
Bicarbonates (mg/l)	207.3		Nitrites - Nitrogen (mg/l)	ND	0.9
Total Hardness as Calcium Carbonate (mg/l)	162		Reactive Phosphorus (mg/l)	ND	
Calcium Hardness as Calcium Carbonate (mg/l)	98		Arsenic (mg/l)	ND	0.05
Magnesium Hardness (mg/l)	15.6	150			0
Sodium (mg/l)	61.7	400	Total Coliform (CFU/ 100 ml)	ND	0
Potassium (mg/l)	2.7	100	E - Coli (CFU/ 100ml) - Presumptive	ND	0

Remarks: (1) NR= Not Required; ND = Not Done; TNTC = Too Numerous Count

(2) The US 201: 2008 ; National Drinking Water Standard is for Untreated Drinking Water Supplies (Water Specification Class II)

MINISTRY OF WATER & ENVIRONMENT REGIONAL WATER QUALITY LABORATORY - LIRA

Approved By: 16 DEC 2019

Head of the Laboratory

QUALITY CONTROL

Upper Nile Water Management Zone

Plot 14 / 16; Maruzi Road Lira; P.O. BOX. 381, Lira.

Rev oct_2019